

3/22/18 "The two most powerful warriors are patience and time."-Leo Tolstoy

HW: "Indefinite Integral" 17-20 a and b only
Test 3 on Wednesday 3/28

AIM: What is the Definite Integral ?

Warm Up:

* Recall: The Indefinite Integral

The diagram shows the expression $\int x^2 dx$ with three annotations:

- A green arrow points from the text "Tells us to find the Anti-derivative" to the integral symbol \int .
- A purple arrow points from the text "Integrand (what we are Integrating)" to the x^2 term.
- A black arrow points from the text "variable we are integrating with respect to." to the dx term.

General Solution : $\frac{x^3}{3} + c$

The Definite Integral

If $F'(x) = f(x)$, then $F(x)$ is the anti-derivative of $f(x)$.

limits of integration $\int_a^b f(x) dx$

"a" and "b" will be numbers where $b > a$ and the answer will also be a number

Evaluate:

$$\begin{aligned}
 \int_0^2 (x^2 + 1) dx &= \left[\frac{x^3}{3} + x + c \right]_0^2 \\
 &= \left(\frac{(2)^3}{3} + (2) + c \right) - \left(\frac{(0)^3}{3} + (0) + c \right) \\
 &= \left(\frac{8}{3} + 2 + c \right) - (0 + 0 + c) \\
 &= \left(\frac{14}{3} + \cancel{c} \right) - (0 + \cancel{c}) \\
 &= \frac{14}{3} - 0 \\
 &= \left(\frac{14}{3} \right)
 \end{aligned}$$

2) Evaluate:

$$\int_1^3 (3x^2 + 4x + 2) dx = \left[\frac{3x^3}{3} + \frac{4x^2}{2} + 2x + c \right]_1^3$$

$$= \left[x^3 + 2x^2 + 2x + c \right]_1^3$$

$$= \left(3^3 + 2(3)^2 + 2(3) + \cancel{c} \right) - \left(1^3 + 2(1)^2 + 2(1) + \cancel{c} \right)$$

$$= (27 + 18 + 6) - (1 + 2 + 2)$$

$$= 51 - 5$$

$$= \boxed{46}$$